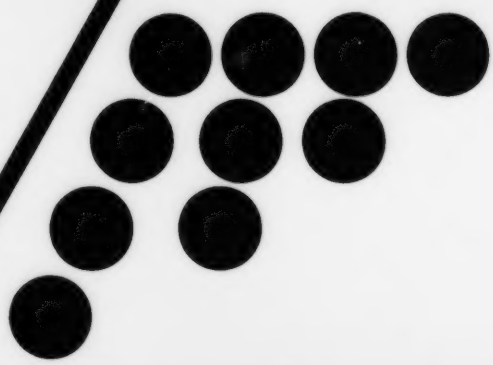
FARM

Food and Agriculture Regional Model

II FARM INPUT PRICE INDEX



Agriculture
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FOOD

FOOD AND AGRICULTURE REGIONAL MODEL

II 6 FARM INPUT PRICE INDEX

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April 1986

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Marketing and Economics Branch

FOREWORD

This publication is one of a series of eleven forming *Food and Agriculture Regional Model (FARM)*, which consists of the following:

Part I *Overview*,
Part II *Commodity Components:*
- *Livestock*,
- *Grains and Oilseeds*,
- *Dairy*,
- *Poultry and Eggs*,
- *Retail Demand*,
- *Farm Input Price Index*,
- *Farm Income*,

Part III *Estimation Results*,
Part IV *Computer Software, and*
Part V *Data Appendix*.

For an introduction to, and a general description of the model in its entirety, see Part I, *Overview*.

The results presented in this report related to the *Farm Input Price Index Block* only and treat other sectors of the model as exogenous.

This report is preliminary and unedited and should not be quoted without the author's permission. The views in the report do not necessarily represent the views of the Government of Canada.

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CONTENTS

Foreword

II 6	Farm Input Price Index (FIPI) Block	7
II 6.1.1	Introduction	7
II 6.1.2	Characteristics of the FIPI Block	7
II 6.1.2.1	Setting	7
II 6.1.2.2	Scope	9
II 6.2	Conceptual Framework	9
II 6.3	Framework of the FIPI Block	10
II 6.3.1	Block Structure	10
II 6.3.2	Equation Specification	11
II 6.4	Data	12
II 6.5	Empirical Results	12
II 6.5.1	Representative Results	12
II 6.5.2	Interpretative Results	14
II 6.6	Validation	14
II 6.7	Assessment	18
II 6.7.1	Application	18
II 6.7.2	Future Research	18
II 6.8	Notes and Bibliography	18
II 6.8.1	Notes	18
II 6.8.2	Bibliography	19
II 6.9	Appendix	20
II 6.9.1	Appendix A – List of Variables and Equations	20
II 6.9.2	Appendix B – Estimation Results	24
II 6.9.3	Appendix C – Graphic Presentation of the Simulation Results	34

TABLES

II 6.1	Farm Input Price Index, Canada (1981 = 100)	8
II 6.2	Selected FIPI weights (distribution of 1981 expenditures)	9
II 6.3	Specification of aggregate FIPI equations	11
II 6.4	Specification of equations with technical features in the FIPI block	11
II 6.5	Empirical results for the major group animal production equations in the FIPI block	13
II 6.6	Interpretative results of the major group animal production	13
II 6.7	Validation results	15
II 6.8	Relative deviation of ex-post prediction for the endogeneous variables of the FIPI block (in percentages) 1983	15
II 6.9	Turning point analysis for the intra-sample simulation	16
II 6.10	Turning point analysis for the extra sample simulation	16

FIGURES

II 6.1	Farm Input Price Index, Canada (1981 = 100)	7
II 6.2	Structure of the FIPI Block	10
II 6.3	Total Farm Input Price Index, Canada, (1981 = 100)	14
II 6.4	FIPI for Animal Production, Canada (1981 = 100)	17
II 6.5	FIPI for Feeder Livestock, Canada (1981 = 100)	17
II 6.6	FIPI for Feed, Canada (1981 = 100)	17
II 6.7	FIPI for Prepared Feed, Canada (1981 = 100)	17
II 6.8	FIPI for Grain Feed, Canada (1981 = 100)	17

II 6 THE FARM INPUT PRICE INDEX

II 6.1.1 Introduction

This report is designed to provide an overview of the *Farm Input Price Index* (FIPI) block describing the characteristics, structure and use as well as the equation specifications, the data used for parameter estimation and the statistical estimates obtained.

The FIPI block is part of Agriculture Canada's *Food and Agriculture Regional Model* (FARM). The FIPI is an important input to the agricultural expenditures block as well as other blocks in FARM. The goal of the FIPI block is to specify equations suitable for short to intermediate term forecasting. The variables exogenous to the FIPI are estimated by FARM and other aggregate econometric models of the economy.

II 6.1.2 Characteristics of the FIPI block

II 6.1.2.1 SETTING

The Farm Input Price Index block permits a broader view of the movement of prices related to agricultural production in Canada and enables us to have an improved input in the agricultural expenditure block as a result of better forecasts for the FIPI variables which are exogenous to the expenditure block.

FIGURE II 6.1 TOTAL FARM INPUT PRICE INDEX, CANADA (1981 = 100)

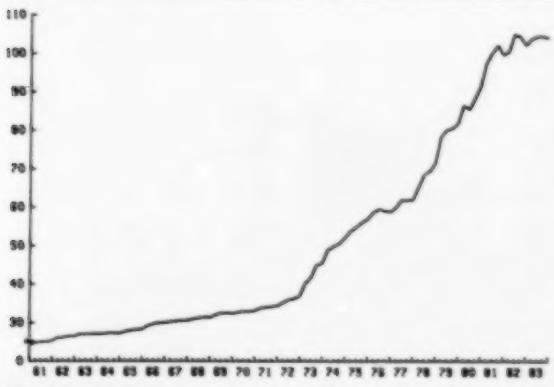


Figure II 6.1 illustrates the behavior of the total FIPI for Canada from the first quarter of 1961 to the fourth quarter of 1983. Between 1961 and 1972, the FIPI increased 3.4% per year on average but from 1973 to 1975 the annual average increase was 15.4% (see Table II 6.1). The movement of the total index over this latter period was due primarily to higher prices for grains as a consequence of production shortfalls and increased demand in the world grain industry. Other items which contributed significantly to the movement were non-mortgage and mortgage interest. For 1976 the total FIPI increased 6.4%; this relatively small increase in comparison with the increase from 1973 to 1975 is due to the change in the price indices for seed, fertilizer, and grain feed which declined in 1976, counterbalancing the upward movement of the other components of the FIPI. In 1977 the total FIPI rose 4.1% over the previous year, as a result of increases in the price indices for building and fencing, machinery and motor vehicles, supplies and services, hired farm labour and property taxes. In 1978 and 1979 the average annual increase of the FIPI was 14.3% as prices for livestock feeds increased considerably as did the interest index, and these increases accounted for most of the upward movement. In 1980 the total FIPI rose 9.6% over 1979 prices; increases for grain feed and interest had the most influence on the index movement. In 1981, the 13.5% increase in the total FIPI resulted mainly from higher price indices for interest, farm rent, and machinery and motor vehicles, which experienced a large increase (21.6%) – mostly because continued increases in domestic energy prices led to a jump of 37.7% in the petroleum products sub-index. For 1982 and 1983 the total FIPI increased only by 3.2% and 1.1% respectively, following increases of 13.5% in 1981 and 9.6% in 1980. This moderate increase was primarily due to declining indices for animal production and crop production; other indices contributing to the moderate increase in the total FIPI were the interest index and farm rent.

TABLE II 6.1 FARM INPUT PRICE INDEXES, CANADA (1981 = 100)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Total	34.2	36.2	43.3	50.5	55.5	59.1	61.5	68.8	80.3	88.0	100.0	103.1	104.3
	3.6	5.9	19.5	16.7	10.0	6.4	4.1	11.8	16.8	9.6	13.5	3.2	1.1
Building and fencing	38.3	42.4	47.9	54.3	58.8	65.3	70.4	77.0	86.6	91.6	100.0	107.1	116.4
		10.6	13.0	13.4	8.2	11.2	7.7	9.4	12.5	5.7	9.2	7.1	8.7
Building replacement	38.4	42.9	49.2	54.2	57.8	65.4	71.0	78.2	88.1	92.2	100.0	106.5	116.9
	6.9	11.8	14.5	10.3	6.7	13.1	8.6	10.1	12.7	4.6	8.4	6.5	9.8
Building repair	38.0	41.6	46.5	52.8	57.3	63.6	68.5	75.0	84.7	90.6	100.0	106.9	115.1
	4.8	9.5	11.9	13.4	8.5	11.0	7.8	9.4	13.0	7.0	10.3	7.0	7.6
Fencing construction	38.3	40.7	43.6	60.5	70.0	71.1	72.4	75.2	81.8	90.0	100.0	113.7	117.4
	4.1	6.3	6.9	39.0	15.6	1.6	1.8	3.9	8.7	10.0	11.1	13.7	3.2
Machinery and motor vehicles	38.0	39.3	41.0	46.4	53.5	58.2	62.5	67.0	74.3	85.6	100.0	109.2	113.6
	3.4	3.3	4.5	13.1	15.3	8.8	7.3	7.2	10.9	15.2	16.9	9.2	4.1
Machinery replacement	39.7	41.2	42.8	48.0	55.5	59.1	63.1	69.5	79.0	89.8	100.0	105.9	110.4
	2.8	3.6	4.1	12.1	15.5	6.4	6.8	10.1	13.7	13.7	11.3	5.9	4.3
Motor vehicle replacement	45.3	46.7	47.6	52.7	58.1	61.1	66.3	72.9	81.4	90.2	100.0	105.5	110.4
	4.3	3.1	2.0	10.7	10.2	5.2	8.4	9.9	11.7	10.8	10.9	5.5	4.6
Autos	52.1	52.9	53.0	56.4	59.8	62.6	67.1	71.6	80.1	89.4	100.0	103.4	107.2
	3.1	1.5	0.1	6.5	6.0	4.6	7.2	6.7	11.8	11.6	11.9	3.4	3.7
Trucks	42.1	43.8	45.3	51.1	57.4	60.6	66.1	73.6	82.2	90.8	100.0	106.3	111.6
	5.5	4.0	3.3	12.9	12.4	5.5	9.1	11.3	11.8	10.5	10.0	6.4	5.0
Machinery and motor vehicle operations	36.1	37.3	39.1	44.5	51.5	57.0	61.2	64.6	70.6	82.2	100.0	112.7	117.2
	3.6	3.1	4.9	13.9	15.7	10.5	7.5	5.5	9.3	16.5	21.6	12.8	4.0
Petroleum products	29.1	29.7	31.5	36.2	43.3	49.7	54.2	57.1	60.5	72.6	100.0	116.9	121.6
	3.5	2.0	6.0	15.0	19.5	15.0	8.9	5.4	6.1	20.0	37.7	16.9	4.0
Maintenance	41.8	43.6	45.4	51.8	58.7	62.5	66.7	70.6	79.8	91.6	100.0	108.2	112.2
	3.6	4.3	4.2	14.1	13.3	6.5	6.6	5.8	13.0	14.9	9.1	8.2	3.7
Crop production	29.1	29.9	35.6	55.8	65.9	61.1	62.1	65.6	73.8	88.8	100.0	100.1	97.8
		2.9	19.1	56.7	18.0	-7.4	1.8	5.6	12.5	20.4	12.5	0.1	-2.2
Seed	31.0	30.3	38.7	63.6	72.6	67.3	69.6	72.2	72.7	86.6	100.0	99.0	97.3
	-0.6	-2.3	27.5	64.4	14.2	-7.4	3.4	3.8	0.7	19.1	15.5	-1.0	-1.8
Fertilizer	29.2	30.4	34.0	48.3	59.8	58.2	58.3	62.2	73.9	89.0	100.0	95.7	90.2
	3.6	4.1	12.0	42.0	23.8	-2.6	0.2	6.6	18.9	20.4	12.4	-4.3	-5.7
Pesticides	26.0	28.0	28.3	44.2	61.4	63.3	65.0	67.9	75.6	87.7	100.0	109.1	112.7
		7.7	0.9	56.5	38.8	3.0	2.8	4.4	11.4	16.0	14.0	9.1	3.3
Animal production	38.1	41.1	57.5	62.4	61.6	62.8	63.7	76.8	94.7	95.9	100.0	99.6	101.4
		8.1	39.7	8.5	-1.2	1.9	1.4	20.5	23.4	1.3	4.2	-0.3	1.8
Feeder livestock	44.1	51.1	66.9	60.0	56.6	59.2	60.5	89.1	117.0	104.8	100.0	104.0	104.0
		15.8	31.0	-10.4	-5.5	4.6	2.1	47.4	31.2	-10.4	-4.6	4.0	-0.0
Feed	32.6	32.8	50.2	64.4	65.3	64.7	64.9	66.0	76.9	88.6	100.0	92.5	96.6
	1.8	0.7	52.9	28.5	1.4	-1.0	0.3	1.7	16.4	15.3	12.8	-7.5	4.5
Prepared feed	35.3	35.5	54.3	64.5	64.8	65.6	69.1	71.1	81.4	90.1	100.0	94.1	97.6
	1.0	0.6	52.7	18.9	0.5	1.2	5.3	2.9	14.6	10.6	11.0	-5.9	3.7
Grain feed	28.5	28.7	44.0	66.5	68.6	65.4	59.1	58.5	70.7	88.5	100.0	82.7	90.5
	4.4	0.6	53.6	51.1	3.2	-4.7	-9.7	-1.0	20.9	25.1	13.0	-17.3	9.4
Supplies and services	41.1	42.5	45.0	50.1	56.7	61.6	66.3	70.9	78.3	87.5	100.0	109.3	115.1
		3.3	6.1	11.2	13.2	8.6	7.5	7.0	10.4	11.8	14.3	9.3	5.3
Hired farm labour	37.6	40.2	45.7	53.8	62.0	71.4	78.4	82.9	87.8	93.0	100.0	106.3	111.9
	4.9	7.0	13.5	17.7	15.4	15.0	9.8	5.7	5.9	6.0	7.5	6.3	5.3
Property taxes	53.3	53.7	51.0	52.7	60.9	70.2	75.0	80.9	82.1	90.6	100.0	115.3	122.0
	0.6	0.8	-5.0	3.3	15.6	15.3	6.8	7.9	1.5	10.4	10.4	15.3	5.8
Interest	15.5	15.8	20.1	28.1	31.7	37.5	37.9	44.0	61.1	71.5	100.0	97.3	86.0
		1.9	27.2	39.8	12.8	18.3	1.1	16.1	38.9	17.1	39.8	-2.7	-11.6
Non mortgage	16.4	16.4	21.6	30.0	31.4	35.8	33.5	39.4	58.5	66.3	100.0	91.4	75.1
		-0.0	31.7	38.9	4.7	14.0	-6.4	17.6	48.5	13.4	50.8	-8.6	-17.8
Mortgage	14.0	14.7	17.9	25.3	31.4	38.8	42.3	48.8	63.2	76.4	100.0	116.0	120.7
		5.0	21.8	41.3	24.1	23.6	9.0	15.4	29.5	20.8	30.9	16.0	4.1
Farm rent	29.3	35.2	39.2	45.1	64.2	67.0	61.9	67.7	71.2	81.6	100.0	102.1	100.8
	1.4	20.1	11.4	15.1	42.4	4.4	-7.6	9.4	5.2	14.6	22.5	2.1	-1.3

Note 1: The first line presented is the FIPI variable. The second line is year-to-year percentage change.

II 6.1.2.2 SCOPE

The FIPI block of the FARM model is comprised of a series of equati·s for forecasting the individual price indices within the aggregate farm input price index. The weights used in the aggregation of these series are derived from the 1981 expenditures of goods and services used by Canadian farmers. Table II 6.2 depicts both the hierarchical structure of the entire FIPI, and the weights of selected constituent indices.

The items and/or sub-groups price indices are aggregated by using weights appropriate to the particular group index. The groups are aggregated to generate the nine major groups. Of the nine major groups, seven are of a general character in a sense that they may contain all expenditures for any typical farm: buildings, machinery, supplies and services, hired farm labour, property taxes, interest and farm rent. The other two major groups aggregate those inputs which are directly identifiable for use either in crop production or animal production.

II 6.2 Conceptual framework

Farm Input Price Indices (1981 = 100) are quarterly base-weighted (Laspeyre's type) indices[1] used to measure the movements of prices paid by farmers for inputs into farm production. Each of the indices measures the impact of price change on the cost of purchasing a constant "basket" of inputs in farm operations, in a 1981 base year. The indices are price indices reflecting only the direct impact of price change on the cost of purchasing the specified basket(s) of farm operation inputs. The indices are not cost of production indices. Changes in cost of production result from many variables in addition to price, such as change in the quantities and qualities of the many items of controlled inputs, and changes in productivity which result not only from management and changes in technology but also from weather and the many biological forces influencing crop and animal growth.

TABLE II 6.2 SELECTED FIPI WEIGHTS (DISTRIBUTION OF 1981 EXPENDITURES)

Index	FIPI weights				
	Total	Major Group	Sub-Group	Group	Item
Total	100				
Building and fencing		4.5			
Building replacement			2.9		
Building repair			1.3		
Fencing construction			0.3		
Machinery & motor vehicles		23.4			
Machinery replacement			10.9		
Motor vehicle replacement			1.1		
Autos					0.3
Trucks					0.8
Machinery & motor vehicles					
Operations			11.3		
Petroleum products				5.2	
Maintenance				5.5	
Crop production		11.6			
Seed			2.0		
Fertilizer			5.7		
Pesticides			2.5		
Animal production		33.2			
Feeder livestock			19.3		
Feed			13.1		
Prepared feed				11.2	
Grain feed				1.9	
Supplies and services		5.4			
Hired farm labour		5.6			
Property taxes		1.2			
Interest		11.8			
Non-mortgage				9.0	
Mortgage				2.8	
Farm rent		3.3			

Source: Statistics Canada

The farm input price indices and their corresponding expenditure weights are presented in Table II 6.2. All major groups – of which animal production (33.2% of the total) and machinery and motor vehicles (23.4%) are the most important - are accounted for. Additionally, selected important groups and sub-groups are included, such as feeder livestock (19.3%) and feed (13.1%) within the major group animal production. Note that the lower-level groups/ subgroups presented in the FIPI block do not necessarily exhaust the relevant higher level category; for example, animal production also includes veterinary services and artifical insemination, which are not explicitly part of the FIPI block since they have a weight of only 0.7% and 0.1% respectively, in the total Farm Input Price Index.

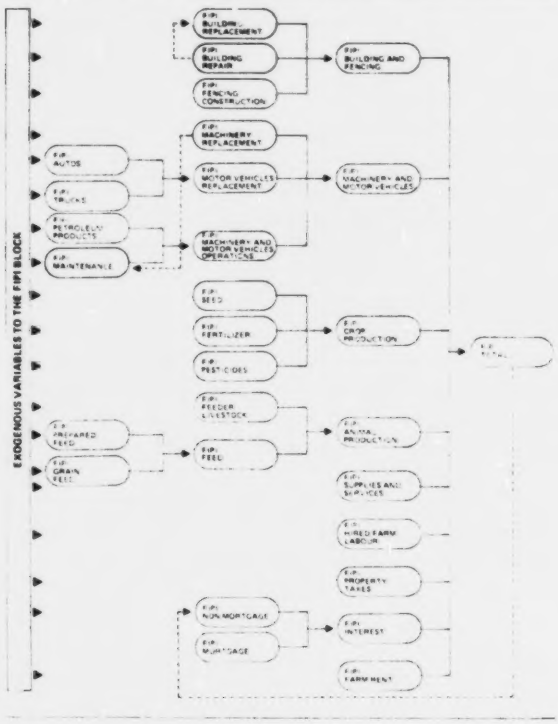
II 6.3 Framework of the FIPI block

II 6.3.1 Block structure

An overview of certain general features of the model's structure is illustrated in Figure II 6.2. The direction of arrows in Figure II 6.2 indicates the order in which the model's equations would be solved, including the feedback links incorporated in the model which are shown in diagram form by the dotted lines. The FIPI for building repair feeds into the FIPI for building replacement; the FIPI for machinery replacement feeds into the FIPI for maintenance; the total FIPI feeds back into the FIPI for non-mortgage interest. Consequently, the presence of feed-back links requires that these equations in the model be solved simultaneously to arrive at solution values consistent with all equations.

The exogenous variables in this block determined by FARM are solved in the following blocks: Grains, Indices of Farm Prices of Agricultural Products, Employment, Beef and Pork, and Investment and Capital. The remaining exogenous variables included in the FIPI block are truly exogenous to FARM - for example the prices paid by farmers for seed, fertilizer and pesticides in the U.S., which are forecasted by the Chase Econometrics Agricultural Model for the USA; another example is the Canada-USA exchange rate which is forecasted by the Conference Board MTFM model of the Canadian economy. A complete listing of exogenous and endogenous variables is presented in appendix A of this report.

FIGURE II 6.2 THE STRUCTURE OF THE FARM INPUT PRICE INDEX BLOCK



In the FIPI block, the equations are solved for each of the items and then for each group and subgroup indices to generate values for the price indices in the major groups. The FIPI for building and fencing (FIPBLD3) is determined using solution values for building replacement (FIPBRPL3), building repair (FIPBRPR3), and fencing construction (FIPFENC3). Similarly, the FIPI for machinery and motor vehicles is solved by using forecast values for machinery replacement (FIPMRPL3), motor vehicles replacement (FIPVRPL3) and machinery and motor vehicles operations (FIPMAOP3). The same approach is used to solve for the FIPI for crop production, animal production, supplies and services, hired farm labour, property taxes, interest, and farm rent; and finally the total FIPI is solved using all major group indices. The equations of the FIPI block are thus partly independent and partly recursive.

II 6.3.2 Equation specification

The FIPI block includes nine identities and twenty stochastic equations. The FIPI identities are presented in Table II 6.3 where the left-hand side variable is explained by weighted averages of explanatory price indices, where each weight represents the ratio of the associated index's FIPI weight to the FIPI weight of the corresponding left-hand side aggregate index. Thus, for example, the weight of FIPBRPL3 in equation two is 0.636, which means that building replacement constitutes 63.6 percent of the building and fencing index. The functional specification of the stochastic equations are of the following form:

TABLE II 6.3 SPECIFICATION OF AGGREGATE FIPI EQUATIONS

1. FIPI for total Inputs

   FIPI3 = .045 * FIPBLD3 + .234 * FIPMACH3 + .116 * FIPCROP3 + .332 * FIPANML3 + 0.054 * FIPSERV3 + .056 * FIPWAGE3 + .012 * FIPTAX3 + .118 * FIPINT3 + 0.033 * FIPRENT3

2. FIPI for Building and Fencing

   FIPBLD3 = .636 * FIPBRPL3 + .292 * FIPBRPR3 + 0.072 * FIPFENC3

3. FIPI for Machinery and Motor Vehicles

   FIPMACH3 = 0.468 * FIPMRPL3 + 0.049 * FIPVRPL3 + .484 * FIPMAOP3

4. FIPI for Motor Vehicle Replacement

   FIPVRPL3 = 0.278 * FIPAU3 + 0.723 * FIPTR3

5. FIPI for Machinery and Motor Vehicle Operations

   FIPMAOP3 = .464 * FIPPET3 + .490 * FIPMAIN3

6. FIPI for Crop Production

   FIPCROP3 = .175 * FIPSEED3 + .492 * FIPFERT3 + .219 * FIPPEST3

7. FIPI for Animal Production

   FIPANML3 = .581 * FIPFDLS3 + .394 * FIPFEED3

8. FIPI for Feed

   FIPFEED3 = .857 * FIPPFD3 + .143 * FIPGFD3

9. FIPI for Interest

   FIPINT3 = .761 * FIPINM3 + .239 * FIPIMG3

$$Y_t = a_0 + a_1 * JS1 + a_2 * JS2 + a_3 * JS3 + b_i * X_{it} + CY_{t-1}$$

where Y_t represents the farm input price index in year t, JS1 (2 or 3) are seasonal dummies taking the value one for the first (second or third) quarter, and zero otherwise, and the X_i's are the values taken by the explanatory variables (that are expected to be of particular relevance to the input being considered), and Y_{t-1} is the lagged dependent variable to account for dynamic adjustments.

Some equations in the FIPI block use conditional statements to improve different simulation values in different time periods; this approach reflects changes in data definitions which have occurred over time. In particular, this approach is used for the FIPI's for seed, taxes and rent. The specification for these equations are presented in Table II 6.4.

TABLE II 6.4 SPECIFICATION OF EQUATIONS WITH TECHNICAL FEATURES IN THE FIPI BLOCK

1: FIPSEED3 = IF YEARQ LE 19794 THEN (IF JS1 EQ 1 OR JS2 EQ 1 THEN PSEED3.0 + PSEED3.1 *FIPSEED3(-1) + PSEED3.2 *FPICROP1 + PSEED3.3*PPSEED4*ER34 ELSE FIPSEED3(-1) ELSE (IF JS3 EQ 1 THEN FIPSEED3(-1) ELSE PSEED3.0 + PSEED3.1*FIPSEED3(-1) + PSEED3.2*FPICROP1 + PSEED3.3 *PPSEED4*ER34)

2: FIPTAX3 = IF JS1 EQ 1 THEN PTAX3.0 + PTAX3.1*TIRPT3 + PTAX3.2*TIRPT3(-1) + PTAX3.3*FIPTAX3(-1) ELSE FIPTAX3(-1)

3: FIPRENT3 = IF JS1 EQ 1 THEN PRENT3.0 + PRENT3.1*SUM (I = -4 TO -1 : FPIAG3(I)/4) + PRENT3.2*SUM (I = -4 TO -1 : VALABLD3(I)/4) ELSE FIPRENT3(-1)

The regression strategy adopted was as follows: dealing with each input in turn, a regression was first run for the period 1971:1 to 1982:4 using the ordinary least squares method. Each regression contained the explanatory variables mentioned above. For each equation the variable with the right sign and significant "t" value was chosen; the final specification was obtained by dropping any variables with coefficient "t" values less than two. Some of the equations have coefficients with "t" values less

than two that were kept because of the importance of the explanatory variable in that particular equation. The dummy variables are considered as a set and therefore the ones with lower "t" values were not eliminated if seasonality has to be accounted for.

The FIPI equations are specified in Appendix B, Estimation Results.

II 6.4 Data

All endogenous variables are items or components of the FIPI in Canada, as published by Statistics Canada in *Farm Input Price Index* (catalogue No. 62-004). The FIPI is a set of price indices which measure the impact of price changes on the cost of a constant basket of commodities (goods and services) purchased by Canadian farmers for use in production of agricultural products. The indices measure price change through time from a base year (1981 = 100) in the cost of a constant collection of goods and services. The target population is all Canadian farms, including family farm partnerships, incorporated and institutional farms, and both full-time and part-time operations.

A periodical update of the index every ten years enables us to relate the present period to an historic one and, through a process of index linking, longer historical time series are achieved. The most recent updating of the FIPI to a 1981 time and weight base was done by Statistics Canada in the first quarter of 1984. The weights now reflect the 1981 purhases by Canadian farmers. Most of the data in the FIPI block are truly quarterly with the exception of property taxes, farm rent, and interest rates. The data for property taxes and farm rent are annual data and the proxy for quarterly series is the annual number repeated in the four quarters. The data for interest switched from annual to quarterly in 1980 due to the volatility of interest rates. As a result, the conversion to a quarterly series prior to 1980 has been reached using the spline function.[2]

Another aspect of the FIPI data concerns changes in the methodology of data collection. Consider the index for seed: up to 1963 the data are annual; from 1964 to 1979 the data are gathered by means of two surveys and after 1979 by three surveys. As a result up to 1963 the four quarters have the same value, from 1964 to 1979 the second, third and fourth quarters are the same and after 1979 the second and third quarters have the same value.

II 6.5 Empirical results

II 6.5.1 Representative results

The FIPI block was estimated using ordinary least squares and quarterly data. For this section some representative results of the animal production major group are tabled for illustration and comment. Estimation results for each equation of the block are listed in Appendix B. Estimated coefficients are accompanied by the standard errors in parentheses below. Coefficients of determination, Durbin-Watson statistics and the standard error of the residuals are also shown.

Table II 6.5 lists results which illustrate the estimated specifications of the animal production major group, which accounts for 33.2% of the total FIPI. The FIPI for animal production includes feeder livestock, and feed (prepared feed and grain feed); it also includes veterinary services and artificial insemination, which are not explicitly part of the FIPI block since they have a weight of only 0.7% and 0.1% respectively in the total FIPI. The coefficients of key explanatory variables have anticipated signs, and are significantly different from zero at a 95 percent level of confidence.

Moreover, statistical fits for the equations are good: the lowest R^2 is 0.989 (in the FIPI for grain feed equation); however, this equation has a Durbin-Watson statistic of 0.83. Attempts to respecify this equation have either led to incorrect signs, or little improvement, therefore this particular equation was chosen. The equations in the animal group index, as well as the rest of the equations in the block, are estimated up to the fourth quarter of 1982; but the start date of the regressions vary depending on the equation.

TABLE II 6.5 EMPIRICAL RESULTS FOR THE MAJOR GROUP ANIMAL PRODUCTION EQUATIONS IN THE FIPI BLOCK

1. FIPANML3 = 0.58 * FIPFDLS3 + 0.39 * FIPFEED3

2. FIPFDLS3 = −8.66 + 0.45 * (PFC2/78.95 * 100) + 0.43 * (PHG2/70.4 * 100) + 0.30 * (PFC1/78.91 * 100)
(1.44) (0.09) (0.08)

+ 2.58 * JS1 + 4.31 * JS2 + 1.44 * JS3
(0.84) (0.88) (0.83)

R2 = 0.994 D.W. = 1.22 S.E.R. = 1.98

3. FIPFEED3 = 0.86 * FIPPFD3 + 0.14 * FIPGFD3

4. FIPPFD3 = −1.64 + 0.37 * (FPDR2/287.9 * 100) + 0.20 * (WPHGS21/344.69 * 100) + 0.10
(0.62) (0.06) (0.02) (0.02)

* (0.165 * (PSM2/295.32 * 100) + 0.835 * (FPCO2/141.08 * 100) + 0.35 * FIPPFD3 (−1)
(0.06)

R2 = 0.997 D.W. = 1.88 S.E.R. = 1.20

5. LOG(FIPGFD3) = −0.27 + 0.25 * LOG(FIPGFD3(−4)) + 0.28 * LOG(FPCO2/141.08 * 100) + 0.13
(0.11) (0.04) (0.07) (0.07)

* LOG(OPOA3/130.82 * 100) + 0.25 * LOG(EXPBA3/177.65 * 100) + 0.15 * LOG(EXPWH3/242.09 * 100)
(0.07) (0.07)

R2 = .989 D.W. = 0.83 S.E.R. = 0.0476

TABLE II 6.6 INTERPRETATIVE RESULTS OF THE MAJOR GROUP ANIMAL PRODUCTION

Explained variables	Explanatory variables	Statistics Canada Weights	Coefficient	t* Values	Short-run elasticities	Long-run elasticities
Feeder Livestock	Cattle	0.79	0.75	0.24	0.75	-
	Hogs	0.17	0.30	8.67	0.34	-
Prepared Feed	Dairy Ration	0.15	0.36	3.5	0.36	0.55
	Hog Concentrate	0.12	0.20	4.4	0.21	0.32
	Laying Mash	0.08	0.10	1.1	0.11	0.17
Grain Feed	Corn	0.38	0.28	1.37	0.28	0.38
	Oats	0.09	0.13	0.54	0.13	0.17
	Barley	0.24	0.24		0.24	0.33
	Wheat	0.27	0.15	1.69	0.15	0.20

* Critical value: t = 2.02 at 5% level of significance and 40 d.f.

As for the rest of the equations in the block, the results indicate that the coefficients have the right sign and they are statistically significant. However, changes will have to be introduced as a result of new data methodology or other changes which may have to be reflected in the model.

II 6.5.2 Interpretative results

The interpretative results for the major group animal production are presented in Table II 6.6 for illustration and comment. This table contains: the Statistics Canada weights, the value of the coefficients, t statistics and the short-run and long-run elasticities. The weights are established by Statistics Canada, the coefficients are the result of the regression analysis, the elasticities are calculated at the point of the means of each of the independent variables. To permit comparison of the coefficients and the weights, the explained and explanatory variables have been specified in the same base (that is a 1981 base); as a result, the ratio of the corresponding means is close to one and consequently the short-run elasticities and the value of the coefficients are quite close. The value of the coefficients and the weights can be compared and statistical differences tested using the t statistics. With this in mind, the results for the animal production major group will be interpreted by comparing the coefficients with the weights.

The animal production major group is composed of the feeder livestock and feed groups. The feeder livestock group index comprises the following sub-group indices: cattle, hogs and poultry. The weight established by Statistics Canada for cattle is 0.79 and the variables used to explain this sub-group index are the prices of feeder calves with coefficient values of 0.30 and 0.45, which together give a value of 0.75. For hogs the coefficient value is 0.30 which seems to be higher than the proportion corresponding to the index for hogs. One explanation for this difference is that this coefficient is picking up other factors not considered explicitly in the equation (such as poultry).

The feed group index comprises the sub-group indices prepared feed and grain feed. The variables used to explain these sub-group indices seem to give us coefficients which are a statistically good representation of the weights of the items forming part of the sub-group index, except for dairy ration and hog concentrate which yield higher values than the corresponding weights, implying that the omitted items are impacting on these coefficients.

In general, the larger elasticities in the major group animal production correspond to the largest weights.

II 6.6 Validation

The FIPI block was simulated as a separate model, distinct from the agricultural sector model (FARM). The estimation results are presented in Appendix B and the list of endogenous and exogenous variables are presented in Appendix A. The model was solved for the intra-sample period starting with the third quarter of 1973 up to the fourth quarter of 1982 and for the extra-sample period from the first quarter of 1983 to the fourth quarter of 1983. The validation results are presented in Tables II 6.7 to II 6.10. Figures II 6.3 to II 6.8 present graphs of actual and predicted levels over the validation period; these graphs give some visual appraisal of the accuracy of the model. But a better appraisal of the performance of the model emerges from an analysis of the indicators discussed below.

FIGURE II 6.3 TOTAL FARM INPUT PRICE INDEX, CANADA (1981 = 100)

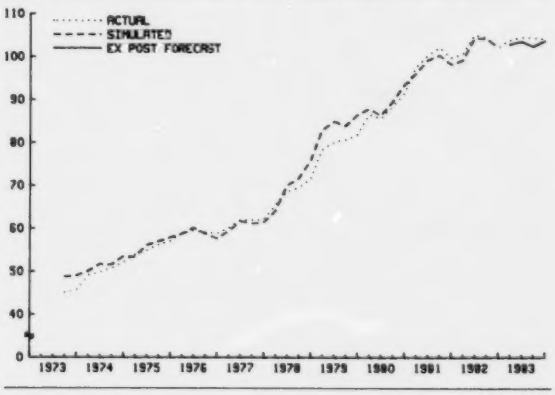


Table II 6.7 presents the results of the measures of forecast accuracy. From this table it can be seen that the root mean square percentage error[3] (RMSPE) for most of the variables is less than 5%. The largest value for the average percentage error (APE) and the RMSPE is for the FIPI for fencing construction but these values improve in the extra-sample period.

TABLE II 6.7 VALIDATION RESULTS

Variable	Intra-Sample 1973:3 to 1982:4					Extra-Sample 1983:1 to 1983:4				
	Mean	AE[1]	RMSE	APE	RMSPE	Mean	AE[1]	RMSE	APE	RMSPE
FIPANML3	78.87	1.19	3.57	1.25	4.30	101.42	-0.69	1.43	-0.68	1.42
FIPAU3	75.47	0.13	1.17	0.23	1.53	107.22	0.52	1.01	0.50	0.94
FIPBLD3	77.45	-0.52	1.14	-0.79	1.64	116.43	0.20	1.89	0.17	1.60
FIPBRPL3	77.76	0.03	0.95	0.04	1.24	116.9	0.	2.10	0	1.76
FIPBRPR3	76.15	0.16	1.08	0.22	1.40	115.12	0.18	1.77	0.15	1.52
FIPCROP3	72.80	-0.91	2.44	-1.44	3.94	97.85	0.97	1.03	0.99	1.06
FIPFDLS3	82.84	-0.29	1.72	-0.42	2.09	104	-0.13	2.41	-0.11	2.40
FIPFEED3	74.95	1.16	2.01	1.79	2.91	96.62	-0.86	0.99	-0.88	1.01
FIPFENC3	79.71	-8.13	9.70	-10.94	13.62	117.37	1.88	2.91	1.61	2.48
FIPFERT3	69.81	0.25	4.61	0.97	7.68	90.17	2.43	2.66	2.70	2.96
FIPGFD3	72.14	-0.27	4.26	0.13	5.18	90.49	-5.27	6.67	-5.53	6.89
FIPIMG3	58.09	0.18	4.15	0.25	10.53	120.72	-32.63	32.77	-27.0	27.08
FIPINM3	52.44	1.88	5.17	6.79	11.41	75.15	-6.05	6.13	-8.04	8.14
FIPINT3	54.74	0.52	3.98	3.48	9.14	85.99	-12.37	12.42	-14.37	14.43
FIPI3	72.60	0.78	1.99	1.31	2.99	104.3	-1.19	1.33	-1.14	1.28
FIPMACH3	71.31	-0.07	0.94	-0.15	1.30	113.65	1.28	1.48	1.13	1.31
FIPMAIN3	75.06	-0.25	1.23	-0.45	1.90	112.17	0.36	0.84	0.32	0.75
FIPMAOP3	69.94	-0.47	1.31	-0.83	2.09	117.2	3.21	3.55	2.77	3.10
FIPMRPL3	72.79	-0.07	1.08	-0.04	1.33	110.37	-0.82	1.86	-0.74	1.69
FIPPEST3	72.46	-0.18	2.82	0.42	7.17	112.67	2.28	3.18	2.04	2.84
FIPPET3	63.89	-0.21	2.45	-0.18	4.31	121.6	6.86	7.67	5.77	6.57
FIPPFD3	77.03	-0.21	1.24	-0.29	1.53	97.59	-0.08	0.74	-0.11	0.77
FIPRENT3	71.62	0.11	3.33	0.57	5.39	100.8	2.92	2.92	2.90	2.90
FIPSEED3	76.11	-0.30	2.84	-0.48	3.97	97.27	-2.23	2.62	-2.28	2.66
FIPSERV3	74.07	-0.14	1.22	-0.10	1.43	115.07	1.95	2.22	1.68	1.91
FIPTAX3	79.28	1.77	2.92	2.65	3.88	122	-3.57	3.57	-2.93	2.93
FIPTR3	74.86	-0.70	2.14	-1.2	2.71	111.65	1.86	2.30	1.69	2.09
FIPVRPL3	74.99	-0.42	1.47	-0.76	1.83	110.42	1.49	1.86	1.37	1.71
FIPWAGE3	79.94	-0.09	0.73	-0.23	1.11	111.87	-1.26	1.28	-1.12	1.14

[1] AE refers to average error and RMSE to root mean square error and APE refers to average percent error and RMSPE to root mean square percent error.

TABLE II 6.8 RELATIVE DEVIATION OF EX-POST PREDICTION FOR THE ENDOGENOUS VARIABLES OF THE FIPI BLOCK, PERCENT, 1983

Variable	1st quarter	2nd quarter	3rd quarter	4th quarter
FIPANML3	-0.521	-0.038	-2.734	0.567
FIPAU3	1.097	1.228	0.478	-0.798
FIPBLD3	-0.254	-0.479	-1.398	2.825
FIPBRPL3	-0.004	-0.746	-2.025	2.796
FIPBRPR3	-0.617	-0.553	-0.974	2.766
FIPCROP3	1.157	0.821	1.480	0.527
FIPFDLS3	-0.174	1.128	-3.919	2.533
FIPFEED3	-0.714	-1.295	-0.156	-1.374
FIPFENC3	-1.500	1.763	2.804	3.371
FIPFERT3	4.466	2.734	2.567	1.039
FIPGFD3	-0.443	-3.352	-6.827	-11.504
FIPIMG3	-24.861	-27.365	-25.620	-30.156
FIPINM3	-7.095	-6.516	-9.548	-9.018
FIPINT3	-12.933	-13.449	-14.896	-16.200
FIPI3	-0.964	-1.033	-2.062	-0.522
FIPMACH3	1.512	0.535	0.455	2.021
FIPMAIN3	0.154	-0.526	0.279	1.363
FIPMAOP3	5.046	2.371	1.283	2.394
FIPMRPL3	-2.216	-1.680	-0.789	1.738
FIPPEST3	-0.605	1.016	3.217	4.522
FIPPET3	10.964	5.450	2.726	3.935
FIPPFD3	-0.685	-0.963	0.937	0.278
FIPRENT3	2.902	2.902	2.902	2.902
FIPSEED3	-0.798	-1.91	-1.91	-4.510
FIPSERV3	0.675	0.994	2.142	2.921
FIPTAX3	-2.928	-2.928	-2.928	-2.928
FIPTR3	0.979	2.668	3.062	0.039
FIPVRPL3	1.049	2.282	2.307	-0.139
FIPWAGE3	-0.858	-1.125	-1.266	-1.268

TABLE II 6.9 TURNING POINT ANALYSIS FOR THE INTRA-SAMPLE SIMULATION

	Turning Point Errors			Both Positive			Both Negative		
	Actual increased	Actual decreased	Total	Over predict change	Under predict change	Total	Over predict change	Under predict change	Total
FIPANML3	1	5	6	11	5	16	4	11	15
FIPAU3		5	5	17	14	31		1	1
FIPBLD3		2	2	15	20	35			
FIPBRPL3		5	5	13	19	32			
FIPBRPR3		1	1	15	21	36			
FIPCROP3		3	3	14	13	27	2	5	7
FIPFDLS3	3	3	6	12	4	16	4	11	15
FIPFEED3	6	1	7	11	7	18	9	3	12
FIPFENC3	1		1	24	12	36			
FIPFERT3	2	7	9	10	11	21	2	5	7
FIPGFD3	5	6	11	6	9	15	6	5	11
FIPIMG3	4	2	6	13	17	30		1	1
FIPINM3	3	2	5	12	10	22	3	7	10
FIPINT3	6		6	13	11	24	2	5	7
FIPI3	4		4	17	10	27	3	3	6
FIPMACH3		1	1	18	18	36			
FIPMAIN3		1	1	18	18	36			
FIPMAOP3		1	1	20	16	36			
FIPMRPL3		1	1	14	22	36			
FIPPEST3	2	4	6	18	12	30		1	1
FIPPET3		3	3	17	17	34			
FIPPFD3	2	4	6	8	10	18	9	4	13
FIPRENT3		1	1	5	3	8			
FIPSEED3	4	3	7	6	5	11	2	1	3
FIPSERV3		1	1	21	15	36			
FIPTAX3				5	4	9			
FIPTR3		1	1	19	17	36			
FIPVRPL3		2	2	17	18	35			
FIPWAGE3				21	16	37			
TOTAL POINTS			108			784			109

TABLE II 6.10 TURNING POINT ANALYSIS FOR THE EXTRA-SAMPLE SIMULATION

	Turning Point Errors			Both Positive			Both Negative		
	Actual increased	Actual decreased	Total	Over predict change	Under predict change	Total	Over predict change	Under predict change	Total
FIPANML3		1	1	1		1		1	1
FIPAU3	1		1	1	1	2			
FIPBLD3		1	1		2	2			
FIPBRPL3		1	1		2	2			
FIPBRPR3		1	1	1	1	2			
FIPCROP3	1	1	2		1	1			
FIPFDLS3		1	1				1	1	2
FIPFEED3	1	2	3						
FIPFENC3		1	1	2		2			
FIPFERT3	1		1		1	1		1	1
FIPGFD3	1		1		2	2			
FIPIMG3	1		1	1		1		1	1
FIPINM3	1		1	1		1	1		1
FIPINT3					2	2		1	1
FIPI3		1	1		1	1		1	1
FIPMACH3		1	1		2	2			
FIPMAIN3				2	1	3			
FIPMAOP3		1	1		2	2			
FIPMRPL3		2	2	1		1			
FIPPEST3		3	3						
FIPPET3		1	1		2	2			
FIPPFD3				1	2	3			
FIPRENT3									
FIPSEED3		2	2						
FIPSERV3				3		3			
FIPTAX3									
FIPTR3		1	1	1	1	2			
FIPVRPL3		1	1	1	1	2			
FIPWAGE3					3	3			
TOTAL POINTS			29			43			8

The average percentage errors and the root mean square percentage errors for the extra-sample simulation are in general smaller than intra-sample period except for interest. The ex-post prediction performance for the FIPI are also presented in a deviation form in Table 8; here again the largest errors occur with regard to the indices for interest.

FIGURE II 6.4 FIPI FOR ANIMAL PRODUCTION, CANADA (1981 = 100)

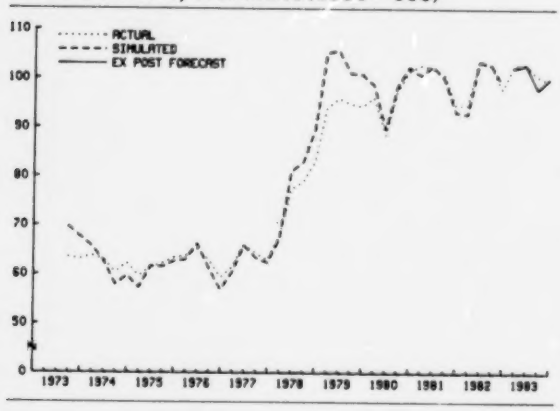
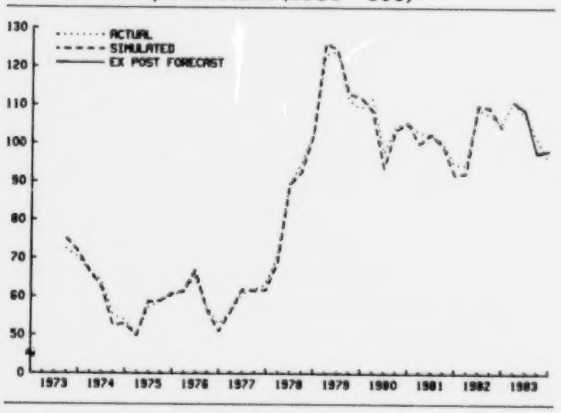


FIGURE II 6.5 FIPI FOR FEEDER LIVESTOCK, CANADA (1981 = 100)



Another important goodness-of-fit measure, which is presented in Table II 6.9, is how well actual turning points are simulated.[4] In the intra-sample period the proportion of turning point errors is 0.11 for the FIPI block, with 108 turning point errors out of 1001 points forecasted. For the extra-sample simulation the proportion is equal to 0.36.

FIGURE II 6.6 FIPI FOR FEED, CANADA (1981 = 100)

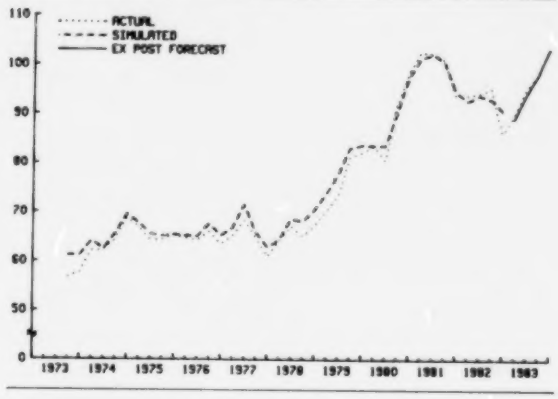


FIGURE II 6.7 FIPI FOR PREPARED FEED, CANADA (1981 = 100)

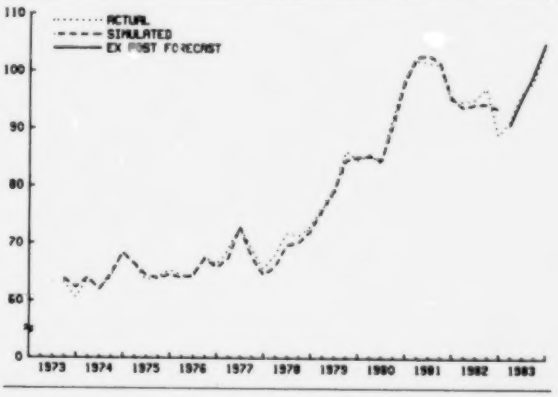
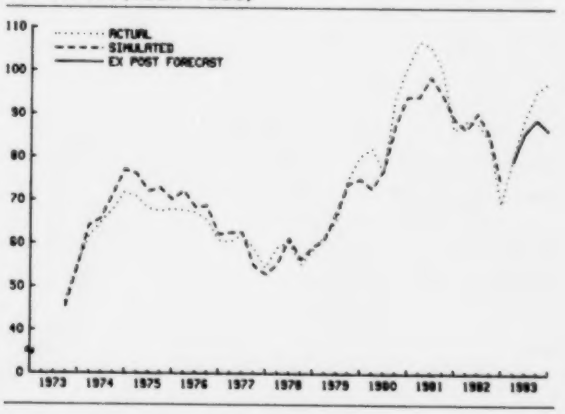


FIGURE II 6.8 FIPI FOR GRAIN FEED, CANADA (1981 = 100)



In general, the simulation results indicate a reasonably good tracking ability for most of the indices. There are exceptions, and these require comment since they are indicative of weaknesses in the model. Within the sample period, the model has difficulty with the farm input price index for interest (mortgage and non-mortgage). This difficulty is not surprising since these items exhibit considerable variance. The other problem with these indices is that there have been changes in the methodology used by Statistics Canada in their calculation. The impact of these methodological changes will be taken into account in the re-specification of these equations.

II 6.7 Assessment

II 6.7.1 Application

The principal application of the FIPI block is its use in forecasting short and medium term projections. The FIPI block also provides some insight concerning input price inflation in the agricultural sector. Another important application of the FIPI is in the supply response relation in the production function analysis. Examples of this application are the analyses conducted of the total marketed production of fresh-use apples and the harvested production of potatoes.

II 6.7.2 Future research

Future work to be done includes refining the current FIPI block's specification and coverage. Immediate work is required on the specification of the FIPI equations for interest.

Part of the future plans is the specification of the rent and taxes equations. The disaggregation of the FIPI for rent into cash rent and share rent will allow the representation of rent from land and buildings and rent from crops.

FIPI evolves through time and when changes occur, they have to be reflected in the model. In order to make it more representative and to improve its forecasting performance, the FIPI block is frequently revised and any modifications will be reported in the next technical bulletin.

II 6.8 Notes and bibliography

II 6.8.1 Notes

1. The base-weighted indices (Laspeyre's type) give an estimate of how much more or less it would cost to purchase a specified group of inputs at present as opposed to the base year. The weights are based on the 1981 estimates for farm expenditures and used in the general formula:

$$I_t = \frac{\frac{P_t}{P_0} P_0 Q_0}{P_0 Q_0} * 100$$

where I_t is an index for the current period. P_t and P_0 are item prices for the current and the base period respectively, and Q_0 is a physical quantity of the item used in the base period.

2. Spline functions are a device for approximating the shape of a curvilinear stochastic function without the necessity of pre-specifying the mathematical form of the function (mathematics of interpolation).

3. The root-mean-square percent error is defined as follows:

$$\text{RMS percent error} = \sqrt{\frac{1}{T} \sum_{t=1}^{T} \left(\frac{Y_t^s - Y_t^a}{Y_t^a} \right)^2}$$

where Y_t^s = the simulated value of Y_t

Y_t^a = the actual value

T = the number of periods in the simulation.

The RMS percent error is a measure of the deviation of the simulated variable from its actual time path in percentage terms. Another measure of simulation performance is the average percent error, defined as

$$\text{Average percent error} = \frac{1}{T} \sum_{t=1}^{T} \frac{Y_t^s - Y_t^a}{Y_t^a}$$

4. The problem with this measure is that a model that predicts "a minuscule advance" when a "minuscule decline" occurs can be judged as being completely wrong.

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II 6.9 Appendix

II 6.9.1 Appendix A – List of variables and equations

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MODEL: FIPI


FARM INPUT PRICE INDEX (FIPI) MODEL, CANADA (1981=100)


SYMBOL DECLARATIONS


ENDOGENOUS:
   FIPANML3 - FARM INPUT PRICE INDEX (FIPI) FOR ANIMAL PRODUCTION,
              CANADA (1981=100)
   FIPAU3   - FIPI FOR AUTO REPLACEMENT, CANADA (1981=100)
   FIPBLD3  - FIPI FOR BUILDING AND FENCING, CANADA (1981=100)
   FIPBRPL3 - FIPI FOR BUILDING REPLACEMENT, CANADA (1981=100)
   FIPBRPR3 - FIPI FOR BUILDING REPAIR, CANADA (1981=100)
   FIPCROP3 - FIPI FOR CROP PRODUCTION, CANADA (1981=100)
   FIPFDLS3 - FIPI FOR FEEDER LIVESTOCK, CANADA (1981=100)
   FIPFEED3 - FIPI FOR FEED, CANADA (1981=100)
   FIPFENC3 - FIPI FOR FENCING CONSTRUCTION, CANADA (1981=100)
   FIPFERT3 - FIPI FOR FERTILIZER, CANADA (1981=100)
   FIPGFD3  - FIPI FOR GRAIN FEED, CANADA (1981=100)
   FIPIMG3  - FIPI FOR MORTGAGE INTEREST, CANADA (1981=100)
   FIPINM3  - FIPI FOR NON-MORTGAGE INTEREST, CANADA (1981=100)
   FIPINT3  - FIPI FOR INTEREST, CANADA (1981=100)
   FIPI3    - FIPI FOR TOTAL INPUTS, CANADA (1981=100)
   FIPMACH3 - FIPI FOR MACHINERY AND MOTOR VEHICLES, CANADA (1981=100)
   FIPMAIN3 - FIPI FOR MACHINERY AND MOTOR VEHICLE MAINTENANCE,
              CANADA (1981=100)
   FIPMAOP3 - FIPI FOR MACHINERY AND MOTOR VEHICLE OPERATIONS,
              CANADA (1981=100)
   FIPMRPL3 - FIPI FOR MACHINERY REPLACEMENT, CANADA (1981=100)
   FIPPEST3 - FIPI FOR PESTICIDES, CANADA (1981=100)
   FIPPET3  - FIPI FOR PETROLEUM PRODUCTS, CANADA (1981=100)
   FIPPFD3  - FIPI FOR PREPARED FEED, CANADA (1981=100)
   FIPRENT3 - FIPI FOR FARM RENT, CANADA (1981=100)
   FIPSEED3 - FIPI FOR SEED, CANADA (1981=100)
   FIPSERV3 - FIPI FOR SUPPLIES AND SERVICES, CANADA (1981=100)
   FIPTAX3  - FIPI FOR PROPERTY TAXES, CANADA (1981=100)
   FIPTR3   - FIPI FOR TRUCK REPLACEMENT, CANADA (1981=100)
   FIPVRPL3 - FIPI FOR MOTOR VEHICLE REPLACEMENT, CANADA (1981=100)
   FIPWAGE3 - FIPI FOR HIRED FARM LABOUR, CANADA (1981=100)

EXOGENOUS:
   CPI3     - CPI FOR ALL ITEMS, CANADA (1981=00)
   ER34     - CANADA-U.S.A. EXCHANGE RATE ($CAN./$U.S.A.)
   EXPBA3   - BARLEY UNIT VALUE EXPORT PRICE, CANADA ($/T)
   EXPWH3   - WHEAT UNIT VALUE EXPORT PRICE, CANADA ($/T)
   FPCO2    - CORN ELEVATOR PRICE, CHATHAM ($/T)
   FPDR2    - PRICE INDEX FOR DAIRY RATION, EASTERN CANADA (1971=00)
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FPIAG3 - INDEX NUMBERS OF FARM PRICES OF AGRICULTURAL PRODUCTS: TOTAL INDEX, CANADA (1971=100)
FPICROP1 - INDEX NUMBERS OF FARM PRICES OF AGRICULTURAL PRODUCTS: TOTAL CROPS, WESTERN CANADA (1971=100)
FPICROP3 - INDEX NUMBERS OF FARM PRICES OF AGRICULTURAL PRODUCTS: TOTAL CROPS, CANADA (1971=100)
FPIGR3 - INDEX NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS: GRAINS CANADA (1971=100)
FPIOS3 - INDEX NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS: OILSEED, CANADA (1971=100)
HWAAG3 - AVERAGE WAGES OF FARM HELP PER HOUR WITHOUT BOARD, CANADA ($/HR)
JS1 - SEASONAL DUMMY, FIRST QUARTER
JS2 - SEASONAL DUMMY, SECOND QUARTER
JS3 - SEASONAL DUMMY, THIRD QUARTER
OPOA3 - OATS OFF-BOARD PRICE, THUNDER BAY ($/T)
PBOIL3 - BLENDED PRICE OF CRUDE OIL, CANADA ($/BBL)
PCHEM4 - PRICES PAID BY FARMERS FOR PESTICIDES, U.S. (1971=100)
PFC1 - PRICE OF FEEDER CALVES (400-600 LB), CALGARY ($/CWT)
PFC2 - PRICE OF FEEDER CALVES (400-600 LB), TORONTO ($/CWT)
PFERT4 - PRICES PAID BY FARMERS FOR FERTILIZER, U.S. (1971=100)
PHG2 - PRICE OF INDEX 100 HOGS, TORONTO ($/CWT)
PINRAG3 - IMPLICIT PRICE DEFLATOR FOR GROSS FIXED CAPITAL FORMATION, AGRICULTURE: NON-RESIDENTIAL CONSTRUCTION (1971=100)
PISAP3 - INDUSTRY SELLING PRICE INDEX FOR MOTOR VEHICLE, PARTS AND ACCESSORIES MANUFACTURES, CANADA (1971=100).
PISCHEM3 - INDUSTRY SELLING PRICE INDEX FOR CHEMICAL INDUSTRIES, CANADA (1971=100)
PISPM3 - INDUSTRY SELLING PRICE INDEX FOR PRIMARY METAL INDUSTRIES, CANADA (1971=100)
PMAAG3 - IMPLICIT DEFLATOR FOR GROSS FIXED CAPITAL FORMATION, AGRICULTURE: FARM MACHINERY (1971=100)
PPSEED4 - PRICES PAID BY FARMERS FOR SEED, U.S. (1971=100)
PSM2 - SOYBEAN MEAL PRICE OF 44% PROTEIN, TORONTO ($/T)
RFCC3 - FARM CREDIT CORPORATION LENDING RATES UNDER THE FARM CREDIT ACT FOR "TEN YEAR" MORTGAGES
RPRIME3 - CHARTERED BANK PRIME BUSINESS LOAN RATE, CANADA
TIRPT3 - LOCAL GOVT. REAL AND PERSONAL PROPERTY TAXES, CANADA ($MILLION, ANNUAL RATES)
VALABLD3 - INDEX OF VALUE OF FARM LAND AND BUILDINGS PER ACRE, CANADA (1971=100)
WA3 - AVERAGE WEEKLY EARNINGS - INDUSTRIAL COMPOSITE, CANADA ($)
WPHGS21 - WHOLESALE PRICE OF HOG SUPPLEMENT 35-40% ONTARIO ($/T).
YEARQ - QUARTERLY TREND VARIABLE WHERE, FOR EXAMPLE, 1980Q1=19801

COEFFICIENT:

FIPI3.1 PANML3.1 PAU3.0 PAU3.1 PAU3.2 PAU3.3 PAU3.4 PAU3.5 PBLD3.1 PBRPL3.0
PBRPL3.1 PBRPL3.2 PBRPL3.3 PBRPR3.0 PBRPR3.1 PBRPR3.2 PBRPR3.3 PBRPR3.4 PBRPR3.5
PCROP3.1 PFDLS3.0 PFDLS3.1 PFDLS3.2 PFDLS3.3 PFDLS3.4 PFDLS3.5 PFDLS3.6 PFEED3.1
PFENC3.0 PFENC3.1 PFENC3.2 PFERT3.0 PFERT3.1 PFERT3.2 PGFD3.0 PGFD3.1 PGFD3.2
PGFD3.3 PGFD3.4 PGFD3.5 PIMG3.0 PIMG3.1 PIMG3.2 PINM3.0 PINM3.1 PINM3.2 PINT3.1
PMACH3.1 PMAIN3.0 PMAIN3.1 PMAIN3.2 PMAIN3.3 PMAOP3.1 PMRPL3.0 PMRPL3.1 PMRPL3.2
PMRPL3.3 PMRPL3.4 PMRPL3.5 PMRPL3.6 PPEST3.0 PPEST3.1 PPEST3.2 PPEST3.3 PPEST3.4
PPET3.0 PPET3.1 PPET3.2 PPET3.3 PPET3.4 PPET3.5 PPFD3.0 PPFD3.1 PPFD3.2 PPFD3.3
PPFD3.4 PRENT3.0 PRENT3.1 PRENT3.2 PSEED3.0 PSEED3.1 PSEED3.2 PSEED3.3 PSERV3.0

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PSERV3.1  PSERV3.2  PTAX3.0  PTAX3.1  PTAX3.2  PTAX3.3  PTR3.0  PTR3.1  PTR3.2  PTR3.3
PVRPL3.1  PWAGE3.0  PWAGE3.1  PWAGE3.2  PWAGE3.3  PWAGE3.4  PWAGE3.5  PWAGE3.7

EQUATIONS

  FIPI FOR TOTAL INPUTS:
1:      FIPI3 = FIPI3.1*(4.5251*FIPBLD3+23.3803*FIPMACH3+11.5552*FIPCROP3+33.2272*FIPANML3
        +5.4446*FIPSERV3+5.64*FIPWAGE3+1.1972*FIPTAX3+11.7569*FIPINT3+3.2735*FIPRENT3)/100

  FIPI FOR BUILDING AND FENCING:
2:      FIPBLD3 = PBLD3.1*(2.878*FIPBRPL3+1.3201*FIPBRPR3+0.3274*FIPFENC3)/4.5251

  FIPI FOR BUILDING REPLACEMENT:
3:      FIPBRPL3 = PBRPL3.0+PBRPL3.1*PINRAG3+PBRPL3.2*FIPBRPR3

  FIPI FOR BUILDING REPAIR:
4:      FIPBRPR3 = PBRPR3.0+PBRPR3.1*PINRAG3+PBRPR3.2*FIPBRPR3(-1)+PBRPR3.3*JS1+PBRPR3.4*
        JS2+PBRPR3.5*JS3

  FIPI FOR FENCING CONSTRUCTION:
5:      LOG(FIPFENC3) = PFENC3.0+PFENC3.1*LOG(PISPM3)+PFENC3.2*LOG(FIPFENC3(-1))

  FIPI FOR MACHINERY AND MOTOR VEHICLES:
6:      FIPMACH3 = PMACH3.1*(10.9318*FIPMRPL3+1.1341*FIPVRPL3+11.3144*FIPMAOP3)/23.3803

  FIPI FOR MACHINERY REPLACEMENT:
7:      LOG(FIPMRPL3) = PMRPL3.0+PMRPL3.1*JS1+PMRPL3.2*JS2+PMRPL3.3*JS3+PMRPL3.4*LOG(
        PMAAG3)+PMRPL3.5*LOG(FPICROP3)+PMRPL3.6*LOG(FIPMRPL3(-1))

  FIPI FOR MOTOR VEHICLE REPLACEMENT:
8:      FIPVRPL3 = PVRPL3.1*(FIPAU3*0.3146+FIPTR3*0.8195)/1.1341

  FIPI FOR AUTOS REPLACEMENT:
9:      FIPAU3 = PAU3.0+PAU3.1*PISAP3+PAU3.2*JS1+PAU3.3*JS2+PAU3.4*JS3+PAU3.5*FIPAU3(-1)

  FIPI FOR TRUCK REPLACEMENT:
10:     FIPTR3 = PTR3.0+PTR3.1*PISAP3+PTR3.2*FIPTR3(-1)

  FIPI FOR MACHINERY AND MOTOR VEHICLE OPERATIONS:
11:     FIPMAOP3 = PMAOP3.1*(FIPPET3*5.2493+FIPMAIN3*5.549)/11.3144

  FIPI FOR PETROLEUM PRODUCTS:
12:     FIPPET3 = PPET3.0+PPET3.1*PBOIL3+PPET3.2*PBOIL3(-1)+PPET3.3*PBOIL3(-2)+PPET3.4*
        FIPPET3(-1)

  FIPI FOR MACHINERY AND MOTOR VEHICLE MAINTENANCE:
13:     LOG(FIPMAIN3) = PMAIN3.0+PMAIN3.1*LOG(FIPMRPL3)+PMAIN3.2*LOG(WA3)+PMAIN3.3*LOG(
        FIPMAIN3(-1))

  FIPI FOR CROP PRODUCTION:
14:     FIPCROP3 = PCROP3.1*(2.0167*FIPSEED3+5.6835*FIPFERT3+2.5341*FIPPEST3)/11.5552
```

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   FIPI FOR SEED:
15:        FIPSEED3 = IF YEARQ LE 19794 THEN (IF JS1 EQ 1 OR JS2 EQ 1 THEN PSEED3.0+PSEED3.1*
           FIPSEED3(-1)+PSEED3.2*FPICROP1+PSEED3.3*PPSEED4*ER34 ELSE FIPSEED3(-1)) ELSE (IF
           JS3 EQ 1 THEN FIPSEED3(-1) ELSE PSEED3.0+PSEED3.1*FIPSEED3(-1)+PSEED3.2*FPICROP1+
           PSEED3.3*PPSEED4*ER34)

   FIPI FOR FERTILIZER:
16:        FIPFERT3 = PFERT3.0+PFERT3.1*(FPIGR3*23.4+FPIOS3*4.93)/28.33+PFERT3.2*(PFERT4*ER34
           )

   FIPI FOR PESTICIDES:
17:        FIPPEST3 = PPEST3.0+PPEST3.1*PCHEM4*ER34+PPEST3.2*PISCHEM3+PPEST3.3*FPICROP1+
           PPEST3.4*FIPPEST3(-1)

   FIPI FOR ANIMAL PRODUCTION:
18:        FIPANML3 = PANML3.1*(19.3056*FIPFDLS3+13.088*FIPFEED3)/33.2272

   FIPI FOR FEEDER LIVESTOCK:
19:        FIPFDLS3 = PFDLS3.0+PFDLS3.1*(PFC2/78.9525*100)+PFDLS3.2*(PHG2/70.453*100)+
           PFDLS3.3*(PFC1/78.91*100)+PFDLS3.4*JS1+PFDLS3.5*JS2+PFDLS3.6*JS3

   FIPI FOR FEED:
20:        FIPFEED3 = PFEED3.1*(FIPPFD3*11.221+FIPGFD3*1.867)/13.088

   FIPI FOR PREPARED FEED:
21:        FIPPFD3 = PPFD3.0+PPFD3.1*(FPDR2/287.9*100)+PPFD3.2*(WPHGS21/344.693*100)+PPFD3.3*
           (0.165*(PSM2/295.319*100)+0.835*(FPCO2/141.081*100))+PPFD3.4*FIPPFD3(-1)

   FIPI FOR GRAIN FEED:
22:        LOG(FIPGFD3) = PGFD3.0+PGFD3.1*LOG(FIPGFD3(-4))+PGFD3.2*LOG(FPCO2/141.081*100)+
           PGFD3.3*LOG(OPOA3/130.818*100)+PGFD3.4*LOG(EXPBA3/177.648*100)+PGFD3.5*LOG(EXPWH3/
           242.086*100)

   FIPI FOR SUPPLIES AND SERVICES:
23:        FIPSERV3 = PSERV3.0+PSERV3.1*CPI3+PSERV3.2*FIPSERV3(-1)

   FIPI FOR HIRED FARM LABOUR:
24:        FIPWAGE3 = PWAGE3.0+PWAGE3.1*HWAAG3+PWAGE3.2*HWAAG3(-1)+PWAGE3.3*FIPWAGE3(-1)

   FIPI FOR PROPERTY TAXES:
25:        FIPTAX3 = IF JS1 EQ 1 THEN PTAX3.0+PTAX3.1*TIRPT3+PTAX3.2*TIRPT3(-1)+PTAX3.3*
           FIPTAX3(-1) ELSE FIPTAX3(-1)

   FIPI FOR INTEREST:
26:        FIPINT3 = PINT3.1*(8.9516*FIPINM3+2.8053*FIPIMG3)/11.7569

   FIPI FOR NON-MORTGAGE INTEREST:
27:        FIPINM3 = PINM3.0+PINM3.1*RPRIME3+PINM3.2*(FIPI3-0.117569*FIPINT3)/0.882431

   FIPI FOR MORTGAGE INTEREST:
28:        FIPIMG3 = PIMG3.0+PIMG3.1*RFCC3+PIMG3.2*VALABLD3

   FIPI FOR FARM RENT:
29:        FIPRENT3 = IF JS1 EQ 1 THEN PRENT3.0+PRENT3.1*SUM(I = -4 TO -1 : FPIAG3(I)/4)+
           PRENT3.2*SUM(I = -4 TO -1 : VALABLD3(I)/4) ELSE FIPRENT3(-1)
```

II 6.9.2 Appendix B – Estimation results

3: FIPBRPL3 = PBRPL3.0+PBRPL3.1*PINRAG3+PBRPL3.2*FIPBRPR3

NOB = 48 NOVAR = 3
RANGE = 1971 1 TO 1982 4
RSQ = 0.99879 CRSQ = 0.99874 F(2/45) = 1.86E+04
SER = 0.7855 SSR = 27.768 DW(0) = 1.34 COND(X) = 119.01
LHS MEAN = 70.33750 SR = 0.00148

COEF	VALUE	ST ER	T-STAT	MEAN
PBRPL3.0	0.48857	0.41746	1.17034	1.00000
PBRPL3.1	0.25880	0.02949	8.77526	183.06600
PBRPL3.2	0.32660	0.07586	4.30504	68.80620

4: FIPBRPR3 = PBRPR3.0+PBRPR3.1*PINRAG3+PBRPR3.2*FIPBRPR3(-1)+PBRPR3.3*JS1+PBRPR3.4*JS2+PBRPR3.5*JS3

NOB = 52 NOVAR = 6
RANGE = 1970 1 TO 1982 4
RSQ = 0.99921 CRSQ = 0.99913 F(5/46) = 1.17E+04
SER = 0.6838 SSR = 21.508 DW(0) = 1.59 COND(X) = 101.55
LHS MEAN = 66.30190 SR = 0.00018

COEF	VALUE	ST ER	T-STAT	MEAN
PBRPR3.0	-0.79747	0.35038	-2.27604	1.00000
PBRPR3.1	0.10942	0.01927	5.67891	176.19200
PBRPR3.2	0.73038	0.05108	14.29760	64.89800
PBRPR3.3	0.18984	0.26994	0.70325	0.25000
PBRPR3.4	0.67719	0.27056	2.50293	0.25000
PBRPR3.5	0.81227	0.26880	3.02184	0.25000

5: LOG(FIPFENC3) = PFENC3.0+PFENC3.1*LOG(PISPM3)+PFENC3.2*LOG(FIPFENC3(-1))

NOB = 33 NOVAR = 3
RANGE = 1974 4 TO 1982 4
RSQ = 0.98919 CRSQ = 0.98847 F(2/30) = 1373.220
SER = 0.0186 SSR = 1.038E-02 DW(0) = 1.36 COND(X) = 129.63
LHS MEAN = 4.41250 SR = -0.00003

COEF	VALUE	ST ER	T-STAT	MEAN
PFENC3.0	-0.02691	0.08961	-0.30027	1.00000
PFENC3.1	0.05164	0.02702	1.91110	5.43352
PFENC3.2	0.94635	0.04387	21.57270	4.39458

7: LOG(FIPMRPL3) = PMRPL3.0+PMRPL3.1*JS1+PMRPL3.2*JS2+PMRPL3.3*JS3+PMRPL3.4*LOG(PMAAG3)+
PMRPL3.5*LOG(FPICROP3)+PMRPL3.6*LOG(FIPMRPL3(-1))

NOB = 48 NOVAR = 7
RANGE = 1971 1 TO 1982 4
RSQ = 0.99919 CRSQ = 0.99908 F(6/41) = 8468.190
SER = 0.0102 SSR = 4.228E-03 DW(0) = 1.29 COND(X) = 773.75
LHS MEAN = 4.13684 SR = 0.00002

COEF	VALUE	ST ER	T-STAT	MEAN
PMRPL3.0	-0.41947	0.07271	-5.76930	1.00000
PMRPL3.1	0.00592	0.00419	1.41432	0.25000
PMRPL3.2	-0.00619	0.00433	-1.43187	0.25000
PMRPL3.3	-0.01270	0.00422	-3.00703	0.25000
PMRPL3.4	0.42340	0.07938	5.33394	5.06155
PMRPL3.5	0.01409	0.00668	2.10838	5.39987
PMRPL3.6	0.56859	0.07747	7.33941	4.11613

9: FIPAU3 = PAU3.0+PAU3.1*PISAP3+PAU3.2*JS1+PAU3.3*JS2+PAU3.4*JS3+PAU3.5*FIPAU3(-1)

NOB = 48 NOVAR = 6
RANGE = 1971 1 TO 1982 4
RSQ = 0.99747 CRSQ = 0.99716 F(5/42) = 3305.540
SER = 0.9548 SSR = 38.286 DW(0) = 1.65 COND(X) = 126.61
LHS MEAN = 70.70620 SR = 0.00072

COEF	VALUE	ST ER	T-STAT	MEAN
PAU3.0	5.28074	0.96557	5.46902	1.00000
PAU3.1	0.27267	0.03938	6.92353	145.15400
PAU3.2	-0.07925	0.40182	-0.19722	0.25000
PAU3.3	-0.39822	0.41566	-0.95806	0.25000
PAU3.4	-0.88281	0.41447	-2.12997	0.25000
PAU3.5	0.37643	0.09442	3.98695	69.56450

10: FIPTR3 = PTR3.0+PTR3.1*PISAP3+PTR3.2*FIPTR3(-1)

NOB = 48 NOVAR = 3
RANGE = 1971 1 TO 1982 4
RSQ = 0.99326 CRSQ = 0.99296 F(2/45) = 3317.110
SER = 1.8206 SSR = 149.154 DW(0) = 2.00 COND(X) = 89.39
LHS MEAN = 68.29580 SR = 0.00072

COEF	VALUE	ST ER	T-STAT	MEAN
PTR3.0	-3.86588	1.26851	-3.04759	1.00000
PTR3.1	0.27548	0.06680	4.12402	145.15400
PTR3.2	0.48138	0.13202	3.64634	66.83750

12: FIPPET3 = PPET3.0+PPET3.1*PBOILL3+PPET3.2*PBOILL3(-1)+PPET3.3*PBOILL3(-2)+PPET3.4*FIPPET3(-1)

NOB = 48 NOVAR = 5
RANGE = 1971 1 TO 1982 4
RSQ = 0.99679 CRSQ = 0.9965 F(4/43) = 3341.980
SER = 1.6113 SSR = 111.637 DW(0) = 1.93 COND(X) = 81.99
LHS MEAN = 56.74580 SR = 0.00017

COEF	VALUE	ST ER	T-STAT	MEAN
PPET3.0	5.40710	2.74463	1.97006	1.00000
PPET3.1	0.96319	0.31757	3.03302	11.87690
PPET3.2	1.12056	0.42352	2.64585	11.23990
PPET3.3	-1.30251	0.34227	-3.80546	10.60190
PPET3.4	0.75095	0.12770	5.88078	54.74790

13: LOG(FIPMAIN3) = PMAIN3.0+PMAIN3.1*LOG(FIPMRPL3)+PMAIN3.2*LOG(WA3)+PMAIN3.3*LOG(FIPMAIN3(-1)
)

NOB = 47 NOVAR = 4
RANGE = 1971 2 TO 1982 4
RSQ = 0.99897 CRSQ = 0.9989 F(3/43) = 1.39E+04
SER = 0.0103 SSR = 4.593E-03 DW(0) = 0.76 COND(X) = 600.58
LHS MEAN = 4.18633 SR = 0.00008

COEF	VALUE	ST ER	T-STAT	MEAN
PMAIN3.0	0.06161	0.05495	1.12116	1.00000
PMAIN3.1	0.38570	0.06956	5.54451	4.14670
PMAIN3.2	0.05027	0.04661	1.07852	5.37939
PMAIN3.3	0.54131	0.08664	6.24793	4.16567

15: FIPSEED3 = IF YEARQ LE 19794 THEN (IF JS1 EQ 1 OR JS2 EQ 1 THEN PSEED3.0+PSEED3.1*FIPSEED3(-1)+PSEED3.2*FPICROP1+PSEED3.3*PPSEED4*ER34 ELSE FIPSEED3(-1)) ELSE (IF JS3 EQ 1 THEN FIPSEED3(-1) ELSE PSEED3.0+PSEED3.1*FIPSEED3(-1)+PSEED3.2*FPICROP1+PSEED3.3*PPSEED4*ER34)

NOB = 48 NOVAR = 4
RANGE = 1971 1 TO 1982 4
RSQ = 0.99152 CRSQ = 0.99094 F(3/44) = 1714.140
SER = 2.1610 SSR = 205.484 DW(0) = 2.20 COND(X) = 32.54
LHS MEAN = 66.98330 SR = 0.00104

COEF	VALUE	ST ER	T-STAT	MEAN
PSEED3.0	3.19691	1.35431	2.36054	0.56250
PSEED3.1	0.39938	0.07493	5.32987	38.04370
PSEED3.2	0.09642	0.00908	10.62510	146.03500
PSEED3.3	0.13584	0.03861	3.51846	61.40340

16: FIPFERT3 = PFERT3.0+PFERT3.1*(FPIGR3*23.4+FPIOS3*4.93)/28.33+PFERT3.2*(PFERT4*ER34)

NOB = 48 NOVAR = 3
RANGE = 1971 1 TO 1982 4
RSQ = 0.96884 CRSQ = 0.96745 F(2/45) = 699.546
SER = 4.2758 SSR = 822.700 DW(0) = 0.83 COND(X) = 12.31
LHS MEAN = 61.59370 SR = 0.00044

COEF	VALUE	ST ER	T-STAT	MEAN
PFERT3.0	1.10734	1.97753	0.55996	1.00000
PFERT3.1	0.01499	0.01308	1.14532	253.64000
PFERT3.2	0.51343	0.02541	20.20660	110.40500

17: FIPPEST3 = PPEST3.0+PPEST3.1*PCHEM4*ER34+PPEST3.2*PISCHEM3+PPEST3.3*FPICROP1+PPEST3.4*FIPPEST3(-1)

NOB = 46 NOVAR = 5
RANGE = 1971 3 TO 1982 4
RSQ = 0.99258 CRSQ = 0.99185 F(4/41) = 1370.690
SER = 2.3832 SSR = 232.862 DW(0) = 1.83 COND(X) = 74.23
LHS MEAN = 64.68040 SR = 0.0014

COEF	VALUE	ST ER	T-STAT	MEAN
PPEST3.0	-12.43280	3.34780	-3.71371	1.00000
PPEST3.1	0.21171	0.06854	3.08866	102.26700
PPEST3.2	0.11509	0.03176	3.62398	186.76400
PPEST3.3	0.01780	0.00690	2.57894	262.71600
PPEST3.4	0.46626	0.12133	3.84286	62.82170

19: FIPFDLS3 = PFDLS3.0+PFDLS3.1*(PFC2/78.9525*100)+PFDLS3.2*(PHG2/70.453*100)+PFDLS3.3*(PFC1/78.91*100)+PFDLS3.4*JS1+PFDLS3.5*JS2+PFDLS3.6*JS3

NOB = 47 NOVAR = 7
RANGE = 1971 2 TO 1982 4
RSQ = 0.99438 CRSQ = 0.99354 F(6/40) = 1179.470
SER = 1.9813 SSR = 157.021 DW(0) = 1.22 COND(X) = 72.25
LHS MEAN = 76.82550 SR = 0.00061

COEF	VALUE	ST ER	T-STAT	MEAN
PFDLS3.0	-8.65628	1.44216	-6.00231	1.00000
PFDLS3.1	0.44623	0.09074	4.91772	77.05520
PFDLS3.2	0.30446	0.01549	19.65970	84.77960
PFDLS3.3	0.29948	0.07574	3.95430	77.50640
PFDLS3.4	2.57786	0.84475	3.05161	0.23404
PFDLS3.5	4.31195	0.88405	4.87751	0.25532
PFDLS3.6	1.44475	0.82565	1.74984	0.25532

21: FIPPFD3 = PPFD3.0+PPFD3.1*(FPDR2/287.9*100)+PPFD3.2*(WPHGS21/344.693*100)+PPFD3.3*(0.165*(PSM2/295.319*100)+0.835*(FPCO2/141.081*100))+PPFD3.4*FIPPFD3(-1)

NOB = 52 NOVAR = 5
RANGE = 1970 1 TO 1982 4
RSQ = 0.99715 CRSQ = 0.99691 F(4/47) = 4118.210
SER = 1.1968 SSR = 67.320 DW(0) = 1.88 COND(X) = 77.51
LHS MEAN = 66.23650 SR = 0.00075

COEF	VALUE	ST ER	T-STAT	MEAN
PPFD3.0	-1.64041	0.62281	-2.63388	1.00000
PPFD3.1	0.36709	0.06181	5.93922	64.89540
PPFD3.2	0.19909	0.01792	11.11060	71.58850
PPFD3.3	0.10380	0.01765	5.88140	68.28600
PPFD3.4	0.34849	0.05877	5.92940	65.17880

22: LOG(FIPGFD3) = PGFD3.0+PGFD3.1*LOG(FIPGFD3(-4))+PGFD3.2*LOG(FPCO2/141.081*100)+PGFD3.3*LOG(OPOA3/130.818*100)+PGFD3.4*LOG(EXPBA3/177.648*100)+PGFD3.5*LOG(EXPWH3/242.086*100)

NOB = 52 NOVAR = 6
RANGE = 1970 1 TO 1982 4
RSQ = 0.98914 CRSQ = 0.98795 F(5/46) = 837.601
SER = 0.0476 SSR = 0.104 DW(0) = 0.83 COND(X) = 147.82
LHS MEAN = 4.02131 SR = 0.00013

COEF	VALUE	ST ER	T-STAT	MEAN
PGFD3.0	-0.27046	0.11452	-2.36176	1.00000
PGFD3.1	0.25467	0.03545	7.18367	3.93946
PGFD3.2	0.28190	0.07324	3.84919	4.15286
PGFD3.3	0.12880	0.07367	1.74839	4.17075
PGFD3.4	0.24513	0.07453	3.28922	4.03776
PGFD3.5	0.14646	0.07142	2.05085	4.03382

23: FIPSERV3 = PSERV3.0+PSERV3.1*CPI3+PSERV3.2*FIPSERV3(-1)

NOB = 47 NOVAR = 3
RANGE = 1971 2 TO 1982 4
RSQ = 0.99879 CRSQ = 0.99873 F(2/44) = 1.82E+04
SER = 0.7756 SSR = 26.471 DW(0) = 1.20 COND(X) = 179.97
LHS MEAN = 68.01910 SR = 0.00034

COEF	VALUE	ST ER	T-STAT	MEAN
PSERV3.0	-1.26787	0.46849	-2.70630	1.00000
PSERV3.1	0.38245	0.11685	3.27296	69.78500
PSERV3.2	0.64032	0.11850	5.40335	66.52550

24: FIPWAGE3 = PWAGE3.0+PWAGE3.1*HWAAG3+PWAGE3.2*HWAAG3(-1)+PWAGE3.3*FIPWAGE3(-1)

NOB = 72 NOVAR = 4
RANGE = 1965 1 TO 1982 4
RSQ = 0.99978 CRSQ = 0.99977 F(3/68) = 1.01E+05
SER = 0.4117 SSR = 11.526 DW(0) = 1.80 COND(X) = 280.80
LHS MEAN = 58.02080 SR = 0.00027

COEF	VALUE	ST ER	T-STAT	MEAN
PWAGE3.0	0.25794	0.11958	2.15713	1.00000
PWAGE3.1	12.02900	1.37116	8.77283	2.62611
PWAGE3.2	-5.78997	1.98861	-2.91157	2.57430
PWAGE3.3	0.72262	0.06109	11.82790	56.84720

25: FIPTAX3 = IF JS1 EQ 1 THEN PTAX3.0+PTAX3.1*TIRPT3+PTAX3.2*TIRPT3(-1)+PTAX3.3*FIPTAX3(-1) ELSE F
IPTAX3(-1)

NOB = 84 NOVAR = 4
RANGE = 1962 1 TO 1982 4
RSQ = 0.99501 CRSQ = 0.99483 F(3/80) = 5321.700
SER = 1.4677 SSR = 172.337 DW(0) = 1.79 COND(X) = 96.84
LHS MEAN = 62.52380 SR = 0.00003

COEF	VALUE	ST ER	T-STAT	MEAN
PTAX3.0	9.68386	2.95105	3.28150	0.25000
PTAX3.1	0.01086	0.00193	5.61815	1218.65000
PTAX3.2	-0.00854	0.00227	-3.76640	1098.31000
PTAX3.3	0.63076	0.09002	7.00714	14.83570

27: FIPINM3 = PINM3.0+PINM3.1*RPRIME3+PINM3.2*(FIPI3-0.117569*FIPINT3)/0.882431

NOB = 47 NOVAR = 3
RANGE = 1971 2 TO 1982 4
RSQ = 0.96722 CRSQ = 0.96573 F(2/44) = 649.109
SER = 5.0694 SSR = 1130.750 DW(0) = 0.42 COND(X) = 17.51
LHS MEAN = 45.64810 SR = 0.0004

COEF	VALUE	ST ER	T-STAT	MEAN
PINM3.0	-35.36190	2.45569	-14.40000	1.00000
PINM3.1	3.73965	0.44192	8.46231	10.98400
PINM3.2	0.58582	0.08048	7.27918	68.16740

28: FIPIMG3 = PIMG3.0+PIMG3.1*RFCC3+PIMG3.2*VALABLD3

NOB = 48 NOVAR = 3
RANGE = 1971 1 TO 1982 4
RSQ = 0.98475 CRSQ = 0.98408 F(2/45) = 1453.340
SER = 4.1268 SSR = 766.366 DW(0) = 0.62 COND(X) = 23.46
LHS MEAN = 49.06250 SR = 0.00057

COEF	VALUE	ST ER	T-STAT	MEAN
PIMG3.0	-45.56920	3.12421	-14.58580	1.00000
PIMG3.1	6.32820	0.62704	10.09220	10.16150
PIMG3.2	0.12372	0.01544	8.01046	245.13300

29: FIPRENT3 = IF JS1 EQ 1 THEN PRENT3.0+PRENT3.1*SUM(I = -4 TO -1 : FPIAG3(I)/4)+PRENT3.2*SUM(I = -4 TO -1 : VALABLD3(I)/4) ELSE FIPRENT3(-1)

NOB = 48 NOVAR = 3
RANGE = 1971 1 TO 1982 4
RSQ = 0.9947 CRSQ = 0.99447 F(2/45) = 4225.940
SER = 1.7003 SSR = 130.095 DW(0) = 1.90 COND(X) = 18.99
LHS MEAN = 63.70830 SR = 0.00032

COEF	VALUE	ST ER	T-STAT	MEAN
PRENT3.0	2.82056	1.97745	1.42638	0.25000
PRENT3.1	0.22132	0.02152	10.28340	48.55270
PRENT3.2	0.08228	0.01253	6.56495	54.40000

II 6.9.3 Appendix C – Graphic presentation of the simulation results

FIGURE II 6.9 FIPI FOR BUILDING AND FENCING, CANADA (1981 = 100)

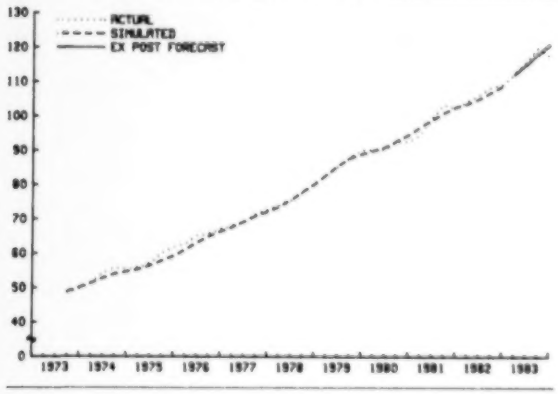

FIGURE II 6.10 FIPI FOR BUILDING REPLACEMENT, CANADA (1981 = 100)

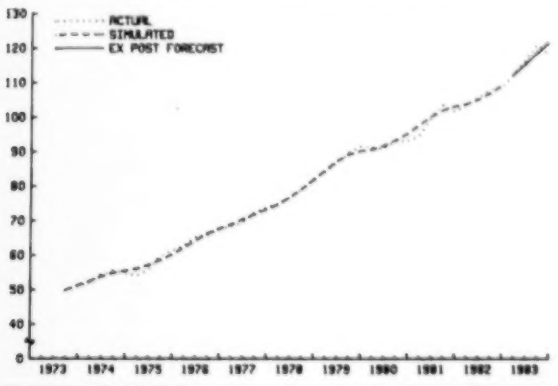

FIGURE II 6.11 FIPI FOR BUILDING REPAIR, CANADA (1981 = 100)

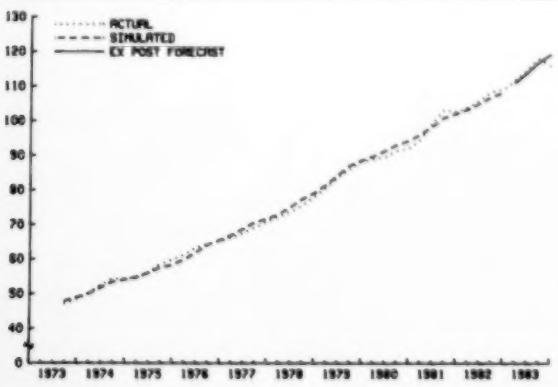

FIGURE II 6.12 FIPI FOR FENCING CONSTRUCTION, CANADA (1981 = 100)

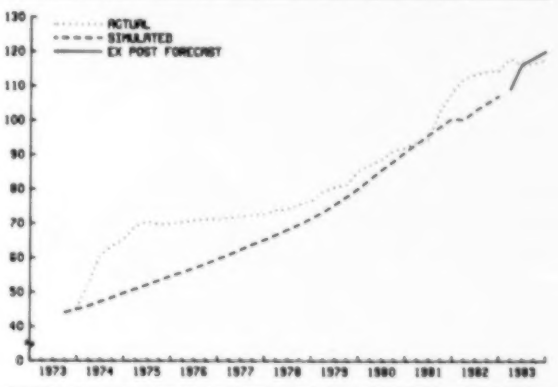

FIGURE II 6.13 FIPI FOR MACHINERY AND MOTOR VEHICLES, CANADA (1981 = 100)

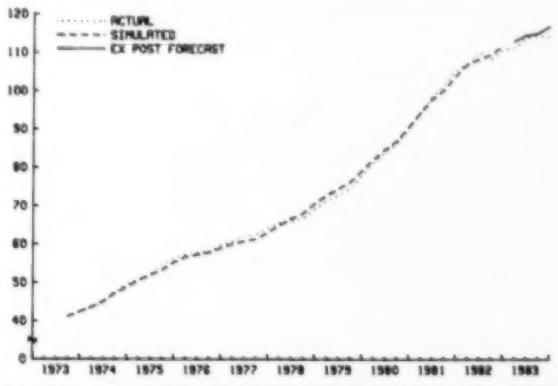

FIGURE II 6.14 FIPI FOR MACHINERY REPLACEMENT, CANADA (1981 = 100)

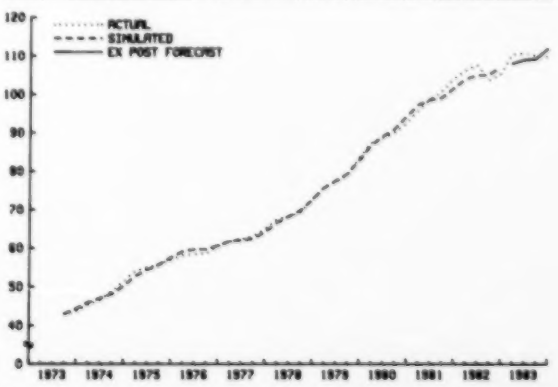

FIGURE II 6.15 FIPI FOR MOTOR VEHICLE REPLACEMENT, CANADA (1981 = 100)

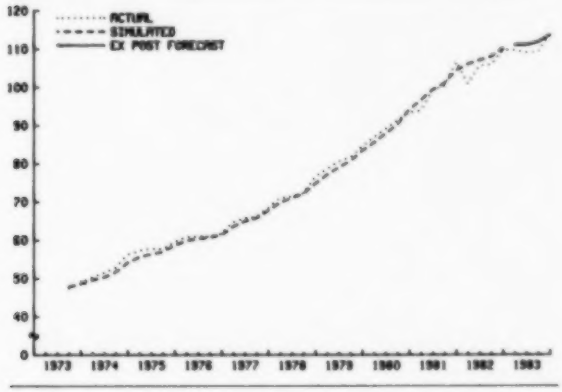

FIGURE II 6.16 FIPI FOR AUTOS, CANADA (1981 = 100)

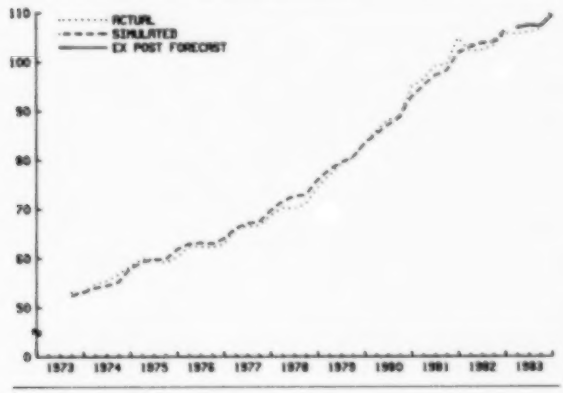

FIGURE II 6.17 FIPI FOR TRUCKS, CANADA (1981 = 100)

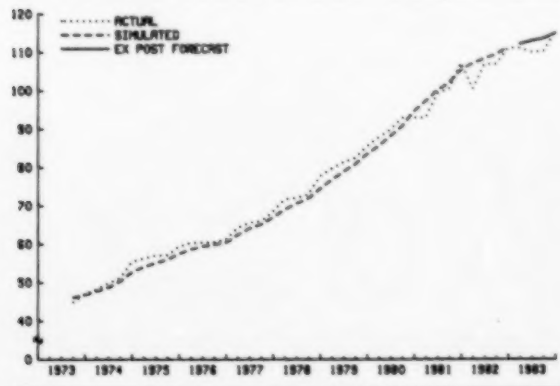

FIGURE II 6.18 FIPI FOR MACHINERY AND MOTOR VEHICLE OPERATIONS, CANADA (1981 = 100)

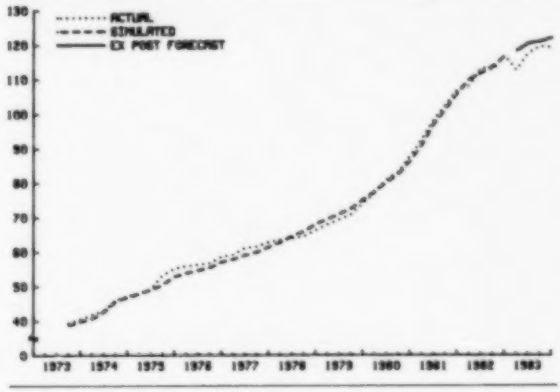

FIGURE II 6.19 FIPI FOR PETROLEUM PRODUCTS, CANADA (1981 = 100)

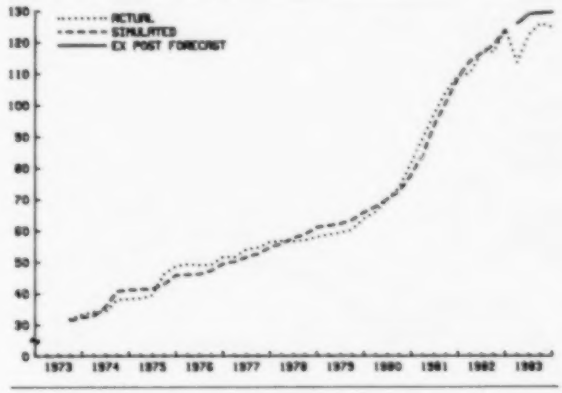

FIGURE II 6.20 FIPI FOR MAINTENANCE, CANADA (1981 = 100)

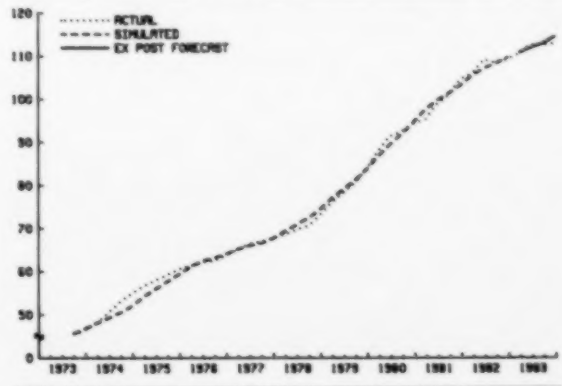

FIGURE II 6.21 FIPI FOR CROP PRODUCTION, CANADA (1981 = 100)

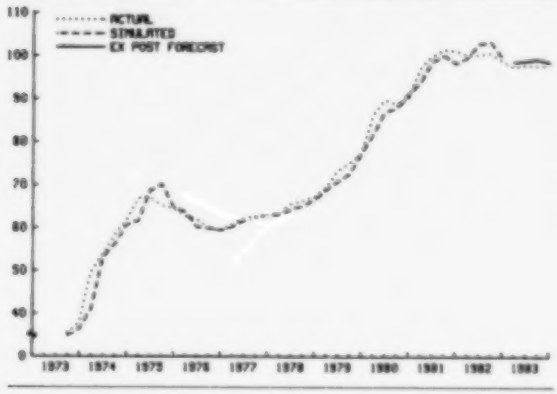

FIGURE II 6.22 FIPI FOR SEED, CANADA (1981 = 100)

FIGURE II 6.23 FIPI FOR FERTILIZER, CANADA (1981 = 100)

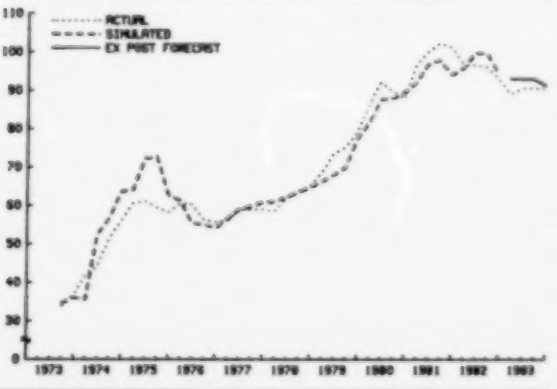

FIGURE II 6.24 FIPI FOR PESTICIDES, CANADA (1981 = 100)

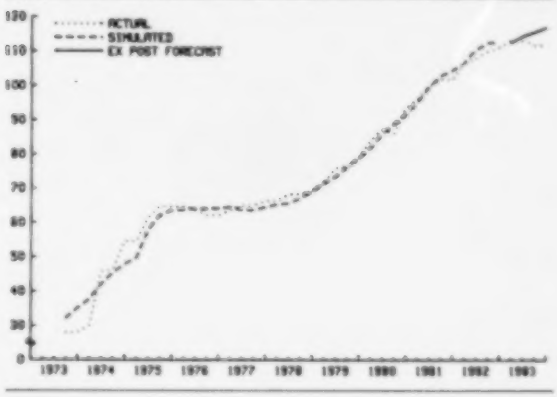

FIGURE II 6.25 FIPI FOR SUPPLIES AND SERVICES, CANADA (1981 = 100)

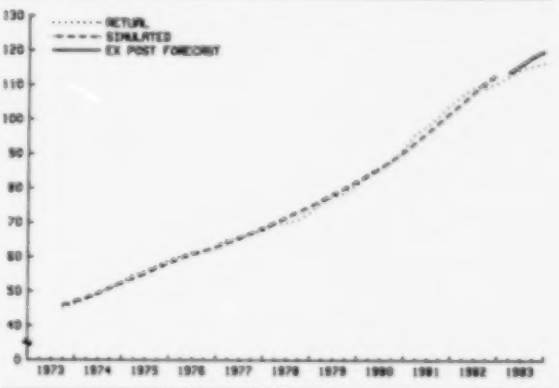

FIGURE II 6.26 FIPI FOR HIRED FARM LABOUR, CANADA (1981 = 100)

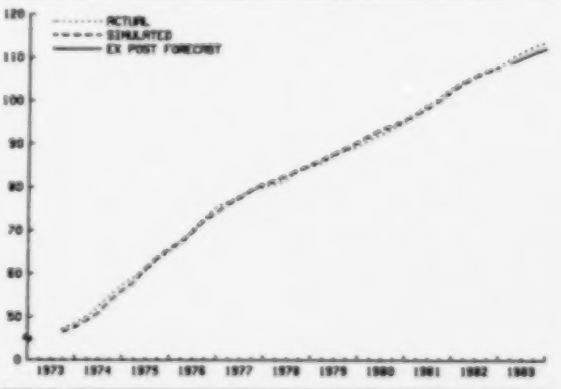

FIGURE II 6.27 FIPI FOR PROPERTY TAXES, CANADA (1981 = 100)

FIGURE II 6.28 FIPI FOR INTEREST, CANADA (1981 = 100)

FIGURE II 6.29 FIPI FOR NON MORTGAGE INTEREST, CANADA (1981 = 100)

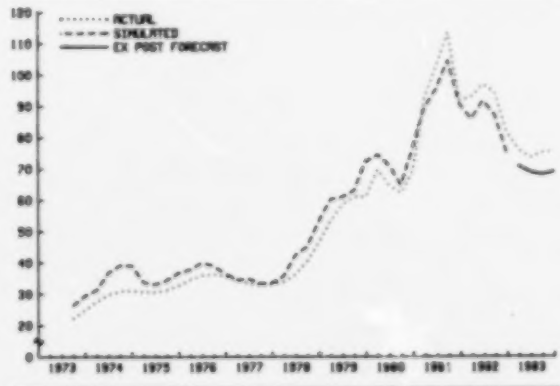

FIGURE II 6.30 FIPI FOR MORTGAGE INTEREST, CANADA (1981 = 100)

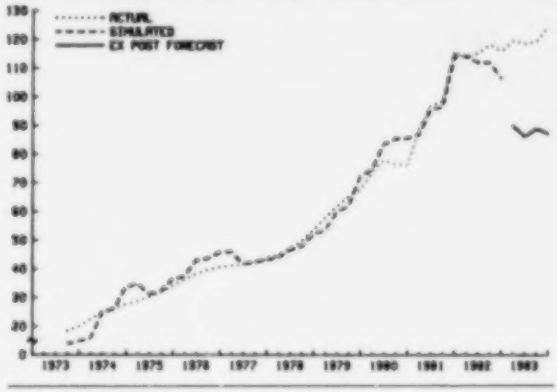

FIGURE II 6.31 FIPI FOR FARM RENT, CANADA (1981 = 100)